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disciple Thomas. After a consideration of the origin and general nature of scholastic speculation and its development in the twelfth century under the auspices of Abelard, Peter Lombard and others, Mr. Taylor gives an account of the rise of the Aristotle-ridden universities and the intellectual rôle of the Mendicant friars. Bonaventura, Albertus Magnus, and Thomas each has a chapter to himself, as well as the intempestive Roger Bacon and those daring spirits, Duns Scotus and Occam, who exercised so potent an influence upon later thinkers. The final chapter is admirably conceived—" The Mediæval Synthesis " which Dante offers in his " Divine Comedy." Every one likely to read Mr. Taylor's book is likely to have Dante on his shelves, and equally unlikely to possess the works of Albert or the " Opus Majus " of Bacon. If, as our author maintains, Dante's long poem is but a poetic *summa* of medieval thought and belief, the reader will find in " The Mediæval Mind " the most elaborate and satisfactory prolegomenon ever prepared for the " Divina Commedia."

Few readers who follow under Mr. Taylor's guidance the long way from Augustine to Dante will leave him without a somewhat bewildering sense of the extraordinary patience, sympathy, and intelligence which has produced the work in hand. There is ever so little that is merely formal or second-hand; the writer has read the works of others, but does not copy them out in his pages. He has doubtless been affected by their views here and there, but his own impressions and convictions are based on a first-hand acquaintance with the medieval writings themselves. He has found time and has had the industry and system necessary at once to collect his material and to assimilate it and " react " on it. To him belongs the highest tribute that the historian may win; he is at once the *érudit* and the *savant*—and of few can this be said.

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A History of the Cavendish Laboratory, 1871–1910. London: Longmans, Green, & Co. 1910. Pp. xi + 342.

Under this modest title we have a really important chapter in the history of scientific thought. On December 22, 1909, J. J. Thomson, on whom has fallen the mantle of Maxwell, completed the twenty-fifth year of his tenure of the Cavendish professorship of experimental physics at the University of Cambridge. In deciding to commemorate the event with a *Festschrift* his colleagues and pupils eschewed the usual form which such volumes now take, viz., that of a series of technical monographs on points of special interest to the writers. Instead they adopted the plan of writing a history of the Cavendish Laboratory, over which Clerk Maxwell, Lord Rayleigh, and J. J. Thomson have in turn presided. The Cavendish Laboratory is easily the foremost British center of physical research, and of late years students from all parts of the world have come to work there. An account of the work done in this laboratory should, therefore, have a great interest for general students of science. Moreover, the plan of the volume, as shown in the letter addressed to the contributors, states:

"It is understood that the present volume should be the record not of what work was done, but of *how that work came to be done.* It is thought that the evolution of the ideas which have inspired physical teaching and research in Cambridge, and the part played in that evolution by the many eminent men who have worked in the laboratory, should be traced as far as possible; and it is hoped that the narration may be made in such a way as to be of interest even to those who are not professed students of our science."

After an introductory chapter on how the laboratory came to be built, there follows a chapter on the Clerk Maxwell period by Professor Shuster, then one on the Rayleigh period by Professor Glazebrook, and a survey of the last twenty-five years by J. J. Thomson himself. These are followed by four detailed surveys, viz: the period of 1885–1894 by Professor Newall, the period of 1895–1898 by Professor Rutherford, the period of 1899–1902 by C. T. R. Wilson, and the period of 1903–1909 by N. R. Campbell. The concluding chapter by Professor Wilberforce treats of the development of the teaching of physics. In the appendix we have some forty odd pages devoted to a list of the published memoirs based on the work done in the Cavendish Laboratory, and also a list of the workers who pursued their researches there, with their official positions, etc. The name index and the subject index which follow can not but enhance the value of the book.

As was to be expected, the various contributors did not interpret their instructions in exactly the same way. Some emphasize the personal and the social side of the work, the inspiration of the great leaders, the genial spirit of cooperation prevailing among the workers, etc. Others describe the relation of the various researches "as they appear in a general and impersonal review" (p. 226).

Professor Shuster's account of the Maxwell period is mainly personal. He describes his relations with Maxwell and the work done in the laboratory which especially interested Professor Shuster. In this, as well as in the introductory chapter, however, we get occasional flashes which illumine for us not only the personality of Maxwell, but also the general ideas which animated his labors. In the seventies it was generally supposed that the only function of a physical laboratory was to measure physical constants. Maxwell, admitting that it is characteristic of modern experiments that they consist principally of measurement, went on in his introductory lecture to add: "Our principal work, however, in the laboratory must be to acquaint ourselves with all kinds of scientific methods, to compare them, and to estimate their value. It will be a result worthy of our university . . . if, by the free and full discussion of the relative values of different scientific procedures, we succeed in forming a school of scientific criticism, and in assisting in the development of the doctrine of method" (p. 17).

It seems almost incredible that Maxwell, by many considered the successor of Newton, should have had only two or three students at his lectures, and that his laboratory equipment should have been so small that he should have found it necessary to report after a few years: "During the present term a skilled workman has been employed in the laboratory, and has already greatly improved the efficiency of several pieces of apparatus." Genius and enthusiasm, however, seem to have been more effective than numbers and means, so that the amount as well as the quality of the work turned out was truly wonderful.

The period of Lord Rayleigh's professorship (1879–1884) was devoted especially to the determination of electrical units; and Professor Glazebrook introduces his account with a remarkably clear exposition of the character of the fundamental units of physics, leading up to the explanation of how the ratio between the electrostatic and the electromagnetic units suggests the electromagnetic theory of light.

Professor Thomson's own account is a genial review of the social side of the work as well as its relation to the demands of Cambridge University. Incidentally and parenthetically we have in a few pages (pp. 92–96) a lucid account of the considerations which led him to formulate the corpuscular or electronic theory of matter.

The detailed survey, by Professor Newall, of the work done in the laboratory between 1885 and 1894 contains a great deal of very valuable material under the subheadings: Experimental Optics, Electro-optics, Properties of Matter, Heat and Thermometry, Electricity and Magnetism, and the Passage of Electricity through Gases. The value of this and other chapters is, however, lessened for the general reader by the fact that the authors do not, or can not, owing to the limitations of space, indicate the importance or subsequent outcome of the experimental work which they describe. Thus on page 133 we are dryly told that a number of experiments by Roiti, Lecher, Wilberforce, and Rayleigh, to detect the influence of the motion of a medium on the velocity of light, failed. In view of the fact that this very question has since come to the forefront of physical discussion, and that the relativity theory is based entirely on these and similar "failures," some comment should have been vouchsafed to "those who are not professed students of our science."

The period from 1895 to 1898 was a momentous one in the history of modern physics, and the part that the Cavendish Laboratory played is told by Professor Rutherford, who was a student of J. J. Thomson's during this period, and who subsequently won the Nobel Prize for his researches on radium emanations. Professor Rutherford indicates how "amongst other discoveries it [the Cavendish Laboratory] witnessed within its walls the final proof of the nature of the cathode rays, the advent of the negative corpuscle or electron, as a definite entity, the experimental proof of the character of the conduction of electricity through gases, and the initial analysis of the radiations from radioactive matter" (p. 159).

The chapter by N. R. Campbell is perhaps more than any other in the book written with an eye for "the reader who is not a professed student of physics." It is full of suggestive ideas, and is from a philosophic point of view perhaps the most satisfactory.

The book is handsomely printed and is in every way pleasant reading. Natives of Hoboken will be sorely disappointed to find Stevens Institute credited on p. 330 to Hobsten, N. J. (wherever that may be). Most

American readers will likewise prefer *class of men* to *class of man.* A more serious misprint, liable to mislead the unwary reader, occurs in the last line on p. 93. The conductivity was due to something mixed with the *gas,* not with the *glass.*

Professional philosophers who light-heartedly speak of atoms and molecules as mere "convenient symbols" will find the reading of this book, or of some of the memoirs mentioned in it, very troublesome. For not only are these "mere concepts" conceived as objective physical entities, but people in Cavendish Laboratory persist in counting them, weighing them, measuring their dimensions, and determining the electrical charges on the minute corpuscles which compose these bodies. No doubt the experimental work is largely interlarded with a great deal of conscious or unconscious assumption; and it can not be said that very clear lines are here always drawn between experimental results and the theories which are intended to explain them. Nevertheless, until some other explanation of this vast mass of experimental work is forthcoming, the theories of Joseph J. Thomson and his disciples will—at least in the eyes of those familiar with the facts—hold the field.

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JOURNALS AND NEW BOOKS

THE PHILOSOPHICAL REVIEW. July, 1911. *The Ontological Problem of Psychology* (pp. 363-385): GEORGE TRUMBULL LADD. - Three topics are considered: first, the more or less scornful objections to the whole subject of ontology; second, the relation of ontology to real human interests; third, the progress attained toward answering the ontological problem of psychology. The greater part of the article is devoted to a discussion of the first topic. The present condition and future prospect of the ontological problem of psychology is considered and illustrated from the corresponding problem in the physical sciences. The concepts space, time, force, and substance are analyzed. *Knowing Things* (pp. 386-404): JOHN E. BOODIN. - "In dealing with things *as known,* we place ourselves at once at the pragmatic point of view—things as they must be *taken* in our systematic experience." "Qualities must be taken as objective, if they enable us to identify and predict the things with which we must deal." Qualities are further distinguished from sensations, relations, and values. *Professor Pringle-Pattison's Epistemological Realism* (pp. 405-421): ALFRED H. JONES. - "The salient feature of this theory . . . consists in a substitution of what the author calls epistemological realism or dualism for the metaphysical dualism of English and continental philosophy. This new form of dualism differs from the traditional form of the theory in that it makes the independent or realistic existence of objects a fact of knowledge or conscious experience instead, as is usually done, of reality or existence." *Reviews of Books* (pp. 422-440). Bertrand Russell, *Philosophical Essays:* EVANDER BRADLEY MCGILVARY.